ELECTRONIC WASTE:
The Case of Agbogbloshie, Ghana

case study | solid waste unit

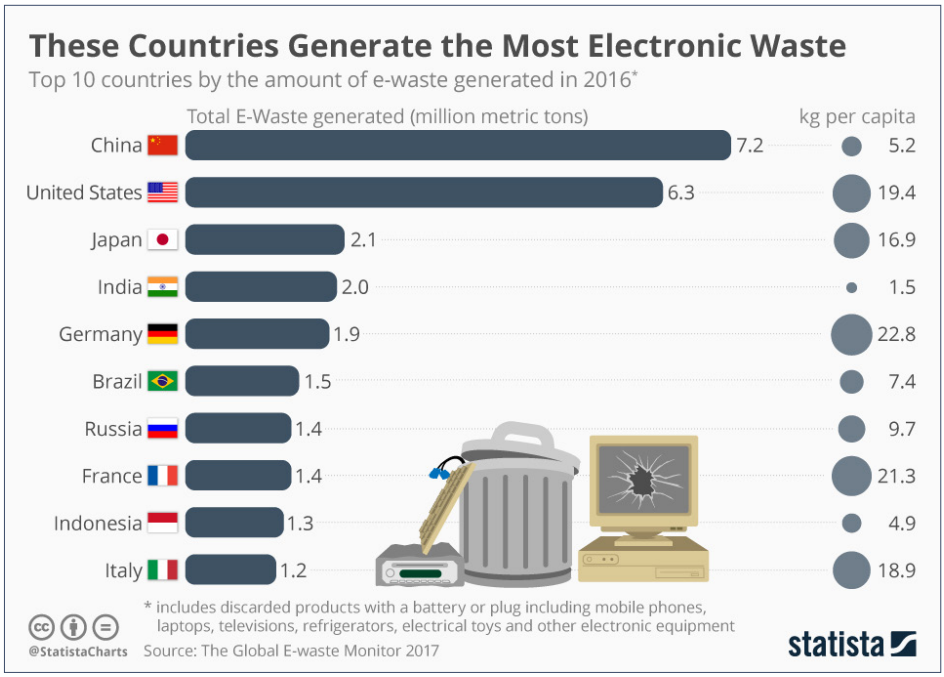
EARTH matters
Studies For Our Global Future

After you text your friends, take a selfie, or upload a catchy lip-sync video to a popular app, you open your smart phone's web browser and see a news story about a smart phone hitting the market soon that can do all those things, and more, only much faster! Your phone is just a year old, but there's a deal to upgrade to the new one. It seems like everyone else is getting one. Will you? And then what happens to your old phone? Unfortunately, improper management of these discarded tech gadgets and electronics contributes to global warming.

The scenario of "buy and discard" is common. In countries like the United States or in Europe, the average life of a cell phone is less than two years.[1] Personal computers are generally kept a little longer. Once they are discarded, they join tablets, computer monitors, lamps, panel televisions, printers – essentially any electronic or electrical equipment that's discarded – in a global electronic waste stream.

Ring, ring... It's me e-waste

In 2019, the world economy generated over 53 million metric tons (Mt) of electronic waste, or **e-waste**.[2] That is more weight than all commercial aircraft ever produced and it's expected to only grow, reaching 75 Mt by 2030. Half of the e-waste weight from 2019 came from large equipment, such as refrigerators, air conditioners or dishwashing machines, as well as small equipment like microwaves, vacuum cleaners, and printers. Screens, monitors, and small IT devices made up a smaller portion of the total weight, as these products are made with lighter materials, even as the number of pieces in the e-waste stream continues to grow.[3]



E-waste generation varies widely among countries. While China and the U.S. generate the most e-waste in absolute amounts each year, other countries generate more e-waste per capita. On the high end is Norway with an average of over 55 pounds per person per year. The United States and Canada average 47 pounds, Saudi Arabia, Turkey and Iraq average 21 pounds, and Japan, China and South Korea 19 pounds. On the lower end, India, Iran and Pakistan average 2.6 pounds, with Ethiopia, Tanzania and Kenya having the lowest per capita e-waste generation, at just under 2 pounds. The global average was 16 pounds per person in 2019, up 3 pounds from 2017.[4]

Where do used electronics go?

What happens to that e-waste depends on what you, as the user, do with it and also on the businesses that are tasked to deal with it and the governments that regulate and enforce it. **Recycling** makes sense. After all, electronics contain valuable materials. A mobile phone, for instance, can contain more than 40 elements, including gold, copper, and cobalt. These precious materials could be used as an important source of secondary raw materials, thus decreasing our need to extract more from the Earth. Yet recycling is complicated. A computer contains over 1,000 different kinds of materials. Some are toxic. Lead, mercury, chromium, and flame retardants are common in e-waste. In 2019, selected raw materials from e-waste totaled roughly $57 billion USD in value.[5]

Electronic waste at a facility.

Because of e-waste's toxic components, many communities require used electronics to be disposed of in special waste collections. A responsible consumer might take their used computer to a special collection site and feel good that they have done the best thing for the planet. Unfortunately, what happens to the waste after that point is difficult to track. Globally, only 17.4 percent of e-waste was formally collected and properly recycled in 2019. The fate of the remaining 82.6 percent is unknown: it is either thrown into residual waste, dumped, traded, or recycled in inferior conditions that harm the environment and human health.[6]

Investigative reporters, non-governmental organizations, and academics are helping to paint a clearer picture of where e-waste ends up. Unfortunately, oftentimes the waste is loaded onto container ships and transported to sites in Africa and Asia that have become some of the most polluted places on Earth.[7] In 2018, China enacted a sweeping reform, "National Sword," banning dozens of types of solid waste from entering the country. Previously, China had imported and processed about 70 percent of the world's e-waste.[8]

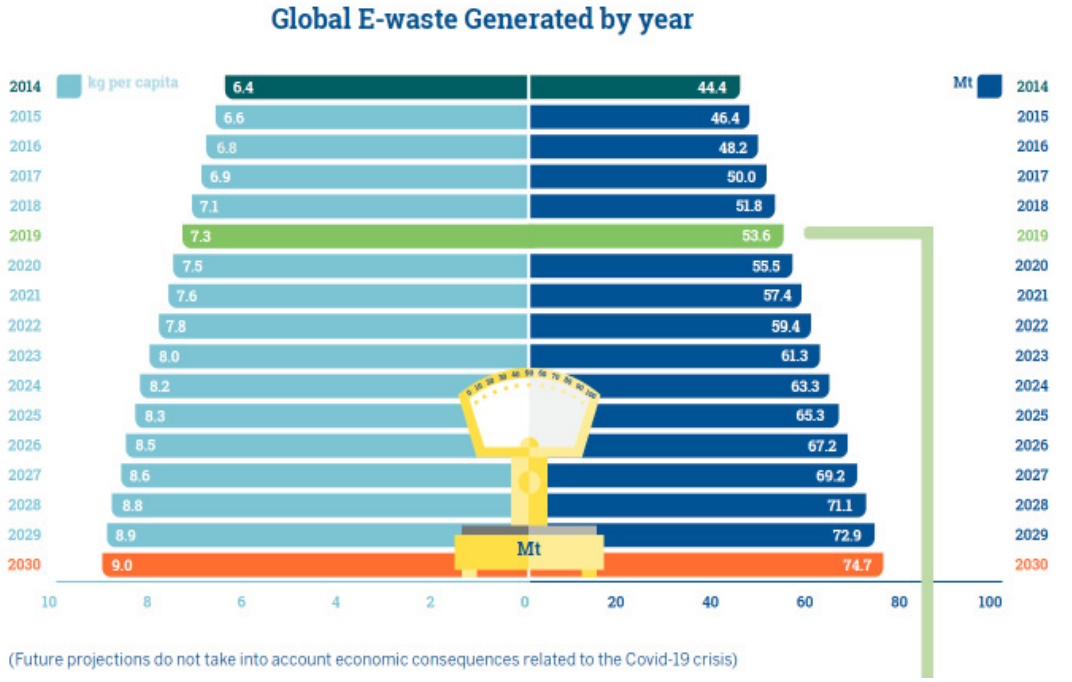
Welcome to Agbogbloshie

Welcome to Agbogbloshie, the word's largest e-waste dumping ground. Located in Accra, the capital of Ghana, and home to some 40,000 people, Agbogbloshie imports some 215,000 tons of used electronics, mostly from Western Europe. Here, workers, most between the ages of 10 and 30, sort through refuse in search of valuable materials with their bare hands. They wear T-shirts and jeans, many with just flip flops on their feet as they move between piles of burning waste billowing black acrid smoke. Some use hammers and chisels to break down electronic equipment or pull coils out of refrigerators. Others set fires in rubber tires to melt plastic and rubber

coatings off copper wires. Insulating foam from discarded refrigerators is their main fuel source. No one wears gloves or respirators, not even a facial mask or bandana. They work for roughly $2.50 a day.[9]

At the end of their shifts, workers get little respite from the smoke and the noise; many live on-site in improvised housing constructed from discarded materials. Drinking water is scarce, and sanitation facilities are limited. Pollution is abundant. E-waste is heavy with lead, mercury, cadmium, and chromium. Associated health effects include cancer, birth defects, impaired mental development, and liver and kidney damage. Children are particularly vulnerable.[10]

Soil samples reveal contamination by dioxins, which promote cancer and disrupt hormonal and immune systems, and high levels of lead, a potent neurotoxin. Air samples taken around workers show excessive aluminum, copper, iron, lead, and zinc. Contaminants can leach into waterways, and air pollution can travel far – even intercontinentally – spreading the damage.[11]



Source: The Global E-Waste Monitor 2020. CC BY-NC-SA 3.0 IGO

The Basel Convention

The conditions in Agbogbloshie are repeated in low-income communities around the world, particularly at sites in China, Cote d'Ivoire, India, Liberia, and Nigeria. They are just what the 1989 Basel Convention (officially the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal) looks to prevent. The European Union (EU) and 52 individual countries have signed on to the Convention, which aims to promote environmentally sound management of **hazardous waste** and reduce its generation. It restricts the transport of hazardous waste across international borders of signatories. In 2019, there was progress when enough countries, 75 percent, ratified an amendment which bans the exportation of hazardous waste from the EU and wealthy OECD countries to other nations. However, several nations have not ratified the amendment, including Australia, Canada, Japan, South Korea, and the United States. (The U.S. has not ratified the Basel Convention.[12])

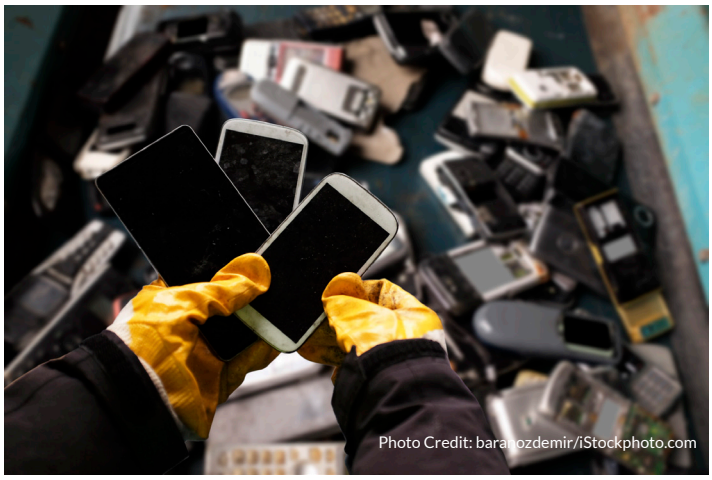


Photo Credit: baranozdemir/iStockphoto.com

Under this Convention, much of the waste that ends up in Ghana or at other hazardous waste destinations in developing regions is illegal, yet there is a large loophole: the Convention allows for the export of used items as second-hand donations, whether or not they are actually usable. While some reuse occurs, much of the electronic discards end up in informal dumps like Agbogbloshie, where young workers risk their health to scavenge the valuable parts. Organized crime syndicates are large players in e-waste movement as well. The United Nations Environment Program (UNEP) estimates that up to 90 percent of global electronic waste, worth close to $19 billion, is illegally traded or dumped each year.[13]

Global cooperation for local solutions

Recently, a German development agency-backed project, in partnership with Ghana's Ministry of Environment, Science, and Technology and Innovation (MESTI), aims to increase environmentally sound recycling and protect workers' health in the Agbogbloshie dump. The first phase of the €5 million project, funded by the German Federal Ministry for Economic Cooperation and Development, created a health clinic and training center to support sustainable e-waste management. Phase two of the project, backed by €10 million, runs from 2020-2022, and supports the Ghanian government's construction of a National Recycling Centre nearby.[14]

Getting a handle on e-waste

National policies and legislation are vital parts of creating sustainable e-waste management. However, the types of e-waste covered by national legislation varies. Some countries have a better handle on their electronic waste. For instance, European countries have some of the highest e-waste recovery rates, collecting 59 percent of their generated e-waste. The European Union's goal is to reach collection rates of 85 percent.[15]

A number of countries have adopted "take-back" legislation, designed to foster "Extended Producer Responsibility." The idea is that companies should be responsible for products they put onto the market, funding and managing the recovery of their products at the end of their useful lives. Japan was an early adopter in legislating responsible e-waste recovery, facilitated by advanced waste management practices already in place.

The U.S. does not have a federal law on the management of e-waste, but 25 states, plus Washington, D.C., have implemented their own laws. But these vary in scope and many areas do not have convenient collection opportunities.[16]

For e-waste recycling policies and programs to be truly successful and safe, they must be independently vetted and monitored. The non-governmental organization Basel Action Network's (BAN's) e-Trash Transparency Project shows why. For two studies released in 2016, BAN researchers attached electronic tracking devices into non-functioning small electronic equipment (printers, flat-screen LCD monitors with mercury backlights, and cathode ray tube monitors) and delivered them to Goodwill stores and other e-waste recycling drop-off locations

around the United States. They found that close to a third of the devices were exported in shipments that would likely be illegal under both U.S. law and importing country or regional government laws. Even electronics delivered directly to certified recyclers that claim to process waste domestically were exported, some at higher than average rates.[16]

Rapid innovation or planned obsolescence?

Solving the e-waste problem requires tracking and transparency to confirm the responsible handling of waste. Strengthening monitoring and enforcement of existing legislation is sorely needed, and manufacturers have a role in reducing the amount of dangerous materials that go into the product life cycle in the first place.

Many electronics, particularly small consumer devices like phones and computers, are designed for short lifetimes. When a sexier and sleeker smart phone is released every 12 months or so, many people are prompted to buy another, whether or not they need the new features. Some electronics have batteries that cannot be swapped out or operating systems that do not run well after required system upgrades. Software on new systems may be incompatible with older versions. This so-called **planned obsolescence** that perpetuates a throwaway economy is not sustainable.

More responsible design could allow for easier repairs, component replacement, and upgrades. For instance, a computer can be made so that its hard drive can be swapped out to avoid replacing the full system. Printer cartridges could be made to be refilled in homes and offices. Instead of clamoring for the quick fix of a product designed to be used and then discarded, consumers could demand products that last. If e-waste is first reduced and then managed correctly, the toxic exposure to workers and nearby communities can also be eliminated, while decreasing the need to extract more virgin raw materials from the Earth to manufacture new products.

Product designers, manufacturers, shippers, consumers, and governments all share responsibility for electronic waste. A shift towards a **circular economy**, where resources are re-used instead of extracted, products are designed for reuse, and advanced recycling collection systems are in place, is what will help create a more sustainable future.

> An 8-minute video from PBS "The Circuit: Tracking Down America's Electronic Waste," investigates the journey of e-waste shipped from recycling centers in the U.S. to Hong Kong.

Author: Janet Larsen (2016); Updated by Andrea Moran (2020)

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[1] Balde, C.P., Forti,V., Gray, V., Kuehr,R., Stegmann, P. (2017). The global e-waste monitor 2017: quantities, flows and resources. Bonn, Germany: United Nations University (UNU).

[2,3,4,5,6,15,16] Forti V., Baldé C.P., Kuehr R., & Bel G. (2020). The global e-waste monitor 2020: quantities, flows and the circular economy potential. Bonn/Geneva/Rotterdam: United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA).

[7] Caravanos, J., Clark, E., Fuller, R., & Lambertson, C. (2011). Assessing worker and environmental chemical exposure risks at an e-waste recycling and disposal Site in Accra, Ghana. Journal of Health and Pollution, 1(1), 16-25. Retrieved from https://www.journalhealthpollution.org/doi/full/10.5696/jhp.v1i1.22

[8] Larmer, B. (2018, July 5). E-waste offers an economic opportunity as well as toxicity. The New York Times. Retrieved from https://www.nytimes.com/2018/07/05/magazine/e-waste-offers-an-economic-opportunity-as-well-as-toxicity.html

[9,10] Burns, K. N., Sun, K., Fobil, J. N., & Neitzel, R. L. (2016). Heart rate, stress, and occupational noise exposure among electronic waste recycling workers. International Journal of Environmental Research and Public Health, 13(1). 140. doi:10.3390/ijerph13010140

[11] Tue, N. M., Goto, A., Takahashi, S., Itai, T., Asante, K. A., Kunisue, T., & Tanabe, S. (2016). Release of chlorinated, brominated and mixed halogenated dioxin-related compounds to soils from open burning of e-waste in Agbogbloshie. Journal of Hazardous Materials, 302, 151-157. doi:10.1016/j.jhazmat.2015.09.062

[12] Basel Convention. (n.d.) Amendment of the basel convention on the control of transboundary movements of hazardous wastes and their disposal. Retrieved from http://www.basel.int/Countries/StatusofRatifications/BanAmendment/tabid/1344/Default.aspx

[13] United Nations Environment Program. (2015, May 12). Illegally traded and dumped e-waste worth up to $19 billion annually poses risks to health, deprives countries of resources, says UNEP report. [Press release]. Retrieved from https://www.unenvironment.org/news-and-stories/press-release/illegally-traded-and-dumped-e-waste-worth-19-billion-annually-poses

[14] Fuller, L. (2020, 12, February). Ghana and Germany continue phase two of e-waste program. E-Waste World. Retrieved from https://www.ewaste-expo.com/ghana-and-germany-continue-phase-two-of-e-waste-program/